ABSTRACT OF THE DISCLOSURE

In Switches, switch inputs and outputs may be grouped into (e.g., small) modules called input shared blocks (or "ISBs") and output shared blocks (or "OSBs"), respectively. Each of the switches includes three (3) main parts: (i) input shared blocks (ISBs); (ii) a central switch fabric (or "ATMCSF"); and (iii) output shared blocks (OSBs). Input link sharing at every ISB-ATMCSF interface and output link sharing at every ATMCSF-OSB interface cooperate intelligently to resolve output contention and essentially eliminate any speedup requirement in central switch fabric. Each of the proposed switches can easily scale to a large size by cascading additional input and output shared blocks (ISBs and OSBs). Instead of using a centralized scheduler to resolve input and output contention, the each of the switches applies a distributed link reservation scheme upon which cell scheduling is based. In one embodiment, a dual round robin dynamic link reservation technique, in which an input shared block (ISB) only needs its local available information to arbitrate potential modification for its own link reservation, may be used. A fast and fair link resource allocation among input shared blocks (ISBs) can be achieved through link request tokens and link release tokens conveyed on dual rings. Arbitration complexity is on the order of one (O(1)) so that scheduling complexity is no longer an obstacle to switch growth. Each of the switches may employ a grouped virtual output queues (GVOQ) for memory management in every input shared block (ISB). Basically, there may be K (where K is the number of output shared blocks (OSBs)) grouped virtual output queues in every input shared block (ISB).

Each virtual queue stores cells going to the same output shared block (OSB). The grouped virtual output queue (GVOQ) scheme is different from virtual output queue (VOQ) schemes proposed for input-queued (IQ) switches where every input port has to maintain N (where N is the switch size, and N >> K) virtual output queues and each virtual queue saves cells going to the same switch output. Compared with the virtual output queue (VOQ) scheme, the grouped virtual output queue (GVOQ) is a cost-effective strategy for the proposed switch because using grouped virtual output queues (GVOQs) results in a simpler scheduling arbitration due to fewer queues in every input shared block (ISB). Additionally, output shared blocks (OSBs) can incorporate per virtual channel (VC) queuing with appropriate cell schedulers to provide quality of service (QoS) guarantees.

One the scalable multicast packet switch may use link sharing and a dual round robin dynamic link reservation scheme. This switch benefits from unique features of a modular switch architecture and a distributed dynamic resource allocation scheme. The switch architecture includes three (3) main parts: (i) input shared blocks (ISBs); (ii) a central switch fabric (ATMCSF); and (iii) output shared blocks (OSBs). Input link sharing at every ISB-ATMCSF interface and output link sharing at every ATMCSF-OSB interface are cooperated intelligently so that no speedup is necessary in central switch fabric. Input shared blocks (ISBs) are connected by dual round robin rings which convey link request tokens (REQs) and link release tokens (RELs) respectively. Cell delivery is based on link reservation in every input shared block (ISB). That is, each input shared block (ISB) should

reserve a link reservation in advance to obtain the desired links at the targeted ATMCSF-OSB interfaces. A queue occupancy-based dynamic link reservation scheduling technique may be used to achieve a fast and fair link resource allocation among input shared blocks (ISBs). The queue occupancy based dynamic link reservation (QOBDLR) is a distributed link reservation algorithm in which an input shared block (ISB), according to its local available information, can dynamically increase and/or decrease its own link reservation by "borrowing" and/or "lending" links through REQ and REL tokens. Arbitration complexity of queue occupancy based dynamic link reservation (QOBDLR) algorithm is on the order of 1 ((O(1)). The performance of the switch is comparable to that of the output queued (OQ) switch.